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10/765,959	01/29/2004	Ralph W. Baxter JR.	8200.709	2328

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/765,959
Filing Date: January 29, 2004
Appellant(s): BAXTER, RALPH W.

George Ayvazov
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 31, 2006 appealing from the Office actions mailed September 9, 2005 and November 21, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,578,654	PORTER	6-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1,4-11,13-20 and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Porter ('654 – Published October 10, 2002).

Porter discloses a torque transmission apparatus (Fig. 2), a differential assembly (Fig. 4), a differential case (110), at least one output shaft (54), a friction clutch (114), a hydraulic clutch actuator (Fig. 5), a hydraulic pump (78), a hydraulic pressure accumulator (104), a housing (123), a drive pinion (220), a pinion shaft (54), a directional valve (136), a piston assembly (128), a reservoir (100), a solenoid control valve (72), an electronic module (68), and anti-lock braking system (150A-150D). Since no structure is associated with the recitation of the differential and noting that the device depicted in Fig. 4 allows differential rotation (Ferguson Layout), it should be noted that for rejection purposes the coupling shown in Fig. 4 is considered a differential.

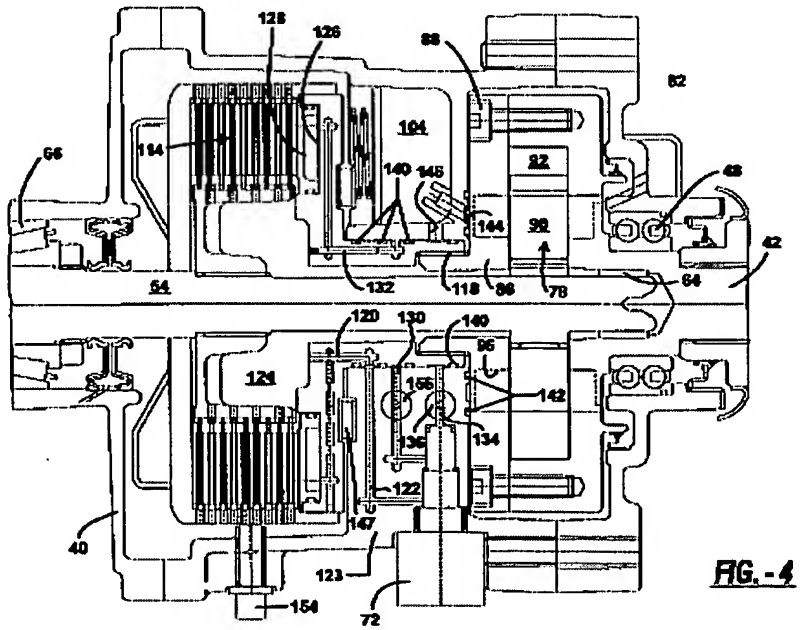


FIG. - 4

(10) Response to Argument

Applicant's arguments have been fully considered but they are not persuasive.

Specifically, applicant's representative alleges that the coupling of Porter shown in Fig. 4 is not a differential. It has been argued, for example, that the prior art does not teach a system or gears (Pg. 13, Remarks filed June 17, 2005), a mechanism allowing rotation *between* two output shafts (pg. 3, remarks filed October 31, 2005), or a mechanism capable of dividing torque between *two* output shafts (pg. 6, Appeal brief filed January 31, 2006). To substantiate applicant's definition, various limiting definitions are being relied upon to support applicant's position (e.g., Dictionary of Automotive Engineering, Dictionary of Mechanical Engineering).

In response, it is the examiner's opinion that the prior art does show a differential. In other words, it simply discloses a device/mechanism that allows differences in speed or direction. In fact, it is submitted that Porter discloses a classic center LSD (limited slip differential) in a Ferguson layout.

Many modern 4-wheel drive system have 3 differentials - one in the front axle to distribute torque between the left and right front wheels, one in the rear axle again responsible for torque distribution, the third one, called a center differential, distributes torque between front and rear axles. Historically center differentials have taken different forms: Torsen-type differentials, viscous coupling differentials, viscous coupling differential locks, active differentials (e.g., Porsche's PSK system, Mercedes' 4-Matic, Nissan's ATTESA). Of these variations, Porter discloses a conventional viscous coupling center differential (http://www.autozine.org). Such viscous coupling center

LSD are commonly used in many simple 4wd systems since they are conveniently inexpensive and do not require extensive maintenance.

Another example is Arimatsu ('229) drivetrain disclosing a conventional viscous coupling center differential (Fig. 3). More importantly, Arimatsu substantiates the examiner's position regarding the aforementioned conventionally recognized terminology in the automotive arts (Col. 7, lines 45-47). Explicitly, it shows that Porter's coupling is also known as a center differential.

Finally, it should be further noted that applicant's own claimed invention (claim 1, line 2) contemplates the possibility of a differential with a single output shaft.

Therefore, for all the aforementioned reasons it is believed that Porter meets the claimed limitations. Of specific relevance for the purpose of the appeal, it is submitted that Porter does teach a differential. Furthermore, it is submitted that a differential does not require a system of gear, or a location between shafts, or a pair of outputs.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

SJR

February 16, 2006

SAUL RODRIGUEZ
PRIMARY EXAMINER

Conferees:

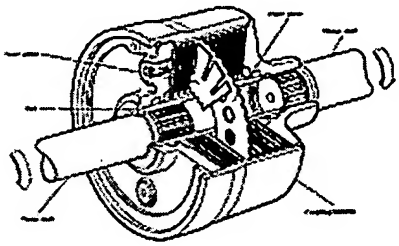
Charles Marmor

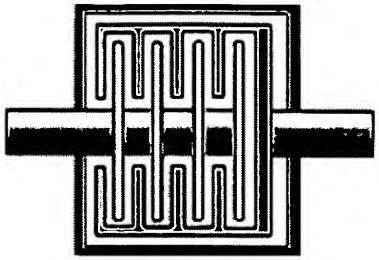
Richard Lorence

Saul J. Rodriguez

2) Viscous-Coupling differential

Viscous Coupling center LSD is commonly used in many simple 4WD systems. One of the earliest examples was Volkswagen's Syncro system.





Inside a viscous coupler as shown in the right hand side picture, there are many circular plates positioning very close to each other. Both drive shafts connect to roughly half of the plates in an alternating sequence as shown. The sealed differential housing is fully contain of a high viscosity liquid, which has a strong tendency to "visco" those plates together.

In normal condition, front and rear axles run at roughly the same speed so the plates and viscous liquid are relatively stable to each other. When tyre slip occurs in one of the axle, that means the alternating plates run at different speed, viscous liquid will try to visco them together. As a result, torque is transferred from the faster driveshaft through the liquid to the slower driveshaft. The greater the speed difference, the larger the torque transfer. As a result, limited slip function is implemented.

Characteristic of Viscous Coupling center differential

Note that Viscous-Coupling LSD is a speed-sensing device: under no-slip condition, no torque will be sent to another axle. Whenever slip occurs, theoretically up to 100% torque can be sent to any axle, depending on the traction difference between front and rear axle. Therefore it is a **part-time 4WD**.

Being a part-time 4WD, it does not have the neutral steering of a permanent 4WD can obtain. For cars based on rear-wheel drive models, such as Porsche 911 Carrera 4, this is not a real problem - as normally the car runs like a RWD car thus is capable to deliver the desirable throttle oversteer . However, for other front-wheel drive-based cars like VW Golf Syncro and Volvo 850 AWD, the part-time 4WD can do nothing to correct their understeering manner. This is the first disadvantage.

The next problem is the delay before the 4WD get into effective. Since viscous liquid is not a fixed medium (unlike gear), it takes time and speed difference to be effective. The function between speed difference and torque transfer is an exponential function - that means in the early stage of slip, torque transfer remains near zero.

To cure this problem, most manufacturer varies the final drive ratio such that introduce a slightly speed difference even in normal condition. As a result, the car actually runs with 95:5 torque split between front and rear. This shorten the delay time. However, it is still impossible to match the pure mechanical Torsen LSD.

It might be less effective than Torsen system, but it is certainly the cheapest, so we can find it in many mass production 4WD cars.

Advantage:	Cheap and compact
Disadvantage:	Part-time 4WD only. Normally feels like 2WD.

Who use it ?	VW Syncro, Lamborghini Diablo VT, Porsche 993/996 Carrera 4 and Turbo, Volvo 850 AWD etc.